CARRIAGE COUPLING DEVICE

Cross-Reference to Related Application

This application claims priority under 35 U.S.C. § 119 and applicable foreign and international law of U.S. Provisional Patent Applications Serial Nos. 60/405,067 and 60/405,069 filed August 20, 2002, each of which is hereby incorporated by reference in its entirety for all purposes.

This application incorporates by reference in its entirety the following U.S. patent applications and patents: U.S. Patent Application Serial No. 09/578,806 filed May 24, 2000 entitled "Automated Fence Control Coupling System"; U.S. Patent Application Serial No. 09/861,231 filed May 17, 2001 entitled "System and Method of Marking Materials for Automated Processing"; U.S. Patent Application Serial No. 10/104,492 filed March 22, 2002 entitled "Automated Fence Control Coupling System"; U.S. Provisional Patent Application Serial No. 60/405,068 filed August 20, 2002 entitled "Process Management System and Method"; and U.S. Patent Nos. 491,307; 2,315,458; 2,731,989; 2,740,437; 2,852,049; 3,994,484; 4,111,088; 4,434,693; 4,658,687; 4,791,757; 4,805,505; 4,901,992; 5,251,142; 5,443,554; 5,444,635; 5,460,070; 5,524,514; and 6,216,574.

Field of the Invention

The invention relates to devices for controlling linear movement of an object such as a fence on a table saw. In particular, the invention involves an assembly for rigidly connecting a positioning carriage to a fence structure on a table saw.

Background of the Invention

Significant effort and attention has been directed over the years at automating material handling and manufacturing. Ultimately, material processing equipment must be cost effective to manufacture and use. Therefore, innovation is needed to produce manufacturing equipment that is affordable, in view of its intended use, without sacrificing or comprising precision, accuracy, and overall functional performance.

Table saws may be equipped with a movable fence to allow an operator to set desired cut dimensions. Table saw fences typically are movable along a rail that is bolted along one side of the table saw. An operator may slide the fence back and forth along the rail and then lock the fence in place by means of a locking handle. Many such table saws are sold in a design that requires manual adjustment of the fence.

Sometimes it is desirable to use a table saw in an automated or semi-automated capacity. Digital positioning systems are available for adding on to a table saw that has a manually operable fence. Aftermarket automated fence positioning systems may be cumbersome to install. Some positioning systems are not flexible enough to be easily mounted on different table saw configurations. Thus, an object of the invention is to provide an automated fence positioning system that is easy to install and to adapt to different table saw designs.

Another object of the invention is to produce a table saw control system that is less expensive to produce compared to prior control systems, without compromising speed, precision, and specifications.

Summary of the Invention

The invention provides automated fence positioning systems that quickly and accurately reposition a fence in the course of executing a pre-determined sequence of cuts on a table saw. An exemplary aspect of the invention utilizes a partially folded rigid sheet structure to connect a positioning carriage to a rip fence structure.

Brief Description of the Figures

Figure 1 is a perspective view of an automated fence positioning system.

Figure 2 is a partial cross-sectional view of the system shown in Figure 1.

Figure 3 is a close-up view of a coupling device shown in Figure 2.

Figure 4 is a partially exploded view of a rail section and a carriage device configured to move inside the rail.

Descriptions of Examples of the Invention

One aspect of the invention involves an assembly for rigidly connecting a positioning carriage to a fence structure. For example, a partially folded sheet member connects a positioning carriage to a fence or associated support structure. A preferred example of a coupling device implemented on a rip saw is described below with reference to Figures 1-4.

Figure 1 shows a perspective view of an exemplary fence control system 20. Fence 22 is provided on a table saw to index a piece of material for cutting relative to saw blade 24. Fence 22 is connected to fence support member 26 which is slidably connected to fence positioning rail 30. Fence positioning rail 30 is coupled to positioning guide rail 34 via clamps or linkage devices 36a and 36b. Carriage coupling device 40 rigidly connects

fence support member 26 to a carriage (shown in Figures 2-4) which moves inside positioning guide rail 34. Screw member 42 is driven by belt and pulley assembly 44 and a motor inside housing 46 to move the carriage along with carriage coupling device 40, fence support member, and fence 22 to properly position materials for cutting.

Figure 2 is a cross-sectional view through the assembly of Figure 1 showing the linkage between internal carriage 50 and carriage coupling device 40. A close-up view of the linkage is shown in Figure 3. Carriage 50 has a cylindrical portion that has internal threads complimenting threads on screw shaft 42. The cylindrical portion of carriage 50 is contained entirely inside positioning guide rail 34. Carriage 50 also has a flange portion 51 that extends through slot 52 and runs substantially the entire length of positioning guide rail 34. Flange portion 51 includes three T-slots. One T-slot has anti-friction surface material 54 so that carriage 50 can move with a low coefficient of friction relative to T-structure 55 on positioning guide rail 34. Two other T-slots are provided. T-slot 56a receives one or more bolts for securing fence structure coupling device 40. T-slot 56b receives one or more bolts for securing interlock plate member 57a. Interlock device 57b is mounted on plate member 57a, and operates to prevent operation of the machine while the carriage is moving. The T-slot configuration shown in Figure 3 provides a rigid, sturdy connection between carriage 50 and carriage coupling device 40, thus enabling carriage 50 to move smoothly on a single rail or guide structure 55 without contacting any other internal surface inside positioning guide rail 34. Therefore, the positioning system can operate with minimal friction making the device more efficient to operate and less expensive to produce compared to prior positioning systems. Alternative slot

arrangements may be used. Other types of fastening devices, for example, bolts with nuts, soldered or welded connections, etc. may also be used.

In Figure 4, a portion of positioning guide rail 34 receives carriage 50. Carriage 50 includes cylindrical portion 60 connected to flange portion 51. Flange portion 51 includes three T-slots 64, 66, and 68 for receiving T-structures or bolts, as discussed above and shown in Figure 3. Collar members 72a and 72b are secured at opposite ends of carriage 50, and are provided with internal threads 74 complimenting external threads on screw 42.

The specific embodiments disclosed and illustrated herein should not be considered as limiting the scope of the invention. Numerous variations are possible without falling outside the scope of the appended claims. For example, the invention may be implemented in numerous different machine configurations with varying levels of automation. The invention may also be used to process many different kinds of materials including, but not limited to, wood, wood composites, polymeric materials such as PVC, polystyrene, polypropylene, polyethylene, fiberglass, textiles, etc. In addition to cutting, the invention may be used to carry out other processing steps such as bonding, sewing, heating, UV curing, painting or graphics application, etc. The subject matter of the invention includes all novel and nonobvious combinations and subcombinations of the various elements, features, functions, and/or properties disclosed herein.